# PATENT COOPERATION TREATY



# PCT

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

| Applicant's or agent's file reference<br>WO 40173 | **FOR FURTHER ACTION** | See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |
|---|---|---|
| International application No.<br>PCT/IB 03/06227 | International filing date *(day/month/year)*<br>30.12.2003 | Priority date *(day/month/year)*<br>15.01.2003 |
| International Patent Classification (IPC) or both national classification and IPC<br>F02F7/00 | | |
| Applicant<br>TOYOTA JIDOSHA KABUSHIKI KAISHA et al. | | |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

| Date of submission of the demand | Date of completion of this report |
|---|---|
| 13.08.2004 | 28.04.2005 |
| Name and mailing address of the international preliminary examining authority:<br>European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized Officer<br>Luta, D<br>Telephone No. +49 89 2399-7333 |

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/IB 03/06227

## I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

**Description, Pages**

1-20 as published

**Claims, Numbers**

1-24 received on 22.03.2005 with letter of 22.03.2005

**Drawings, Sheets**

1/19-19/19 as published

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☒ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

   *(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

| | | | |
|---|---|---|---|
| Novelty (N) | Yes: | Claims | 1-24 |
| | No: | Claims | |
| Inventive step (IS) | Yes: | Claims | 1-24 |
| | No: | Claims | |
| Industrial applicability (IA) | Yes: | Claims | 1-24 |
| | No: | Claims | |

2. Citations and explanations

**see separate sheet**

**To point V**

Reference is made to the following documents:

D1: US4930470

D2: US4848292

**Independent claim 1**

The closest prior art document D2 shows a composite cylinder head 10 whereby the cylinder head water jacket is built between a resin made outer part and a combustion chamber and port unit 12. However according to the second invention the outer cylinder head is pressed between the main body cylinder head and the cylinder block, whereas the combustion chamber and port unit 12 of D2 is clamped between the outer part and the cylinder block. Such a fixation solution is different as the one in D2 and is not suggested by the available prior art.

Claims 2 to 5 and 16 to 24 are dependent on claim 1 and such also meet the requirements of PCT with respect of novelty and inventive step.

**Independent claim 6**

An engine main body according to independent claim 6 whereby a common outer cylinder block, which is separately moulded, defines the outer wall of the water jacket of both the cylinder head and the main body cylinder block solves the water jacket casting problems related to cylinder head and cylinder block as well. Such a configuration is neither suggested nor disclosed by the available prior art.

Claims 7 to 15 are all dependent on claim 6 and such also meet the requirements of PCT with respect of novelty and inventive step.

CLAIMS:

1. A cylinder block in which a water jacket (50; 450) is formed around a cylinder (12; 412), and which, combined with a separate cylinder head (8), forms an engine main body (2), the cylinder block characterized by comprising:

a main body cylinder block (4; 404) which has a mounting surface (24; 424) and which defines a cylinder (12; 412) side of the water jacket (50; 450), and

an outer cylinder block (6; 406) which is molded separately from the main body cylinder block (4; 404) as a cylinder block portion which defines a side of the water jacket (50; 450) opposite the cylinder (4; 412) side, the outer cylinder block (6; 406) being arranged in a predetermined position so as to be on the mounting surface (24; 424) of the main body cylinder block (4; 404) so as to define, together with the main body cylinder block (4; 404), the water jacket (50; 450), the outer cylinder block (6; 406) to be fixed in place while pressed between the cylinder head (8) and the main body cylinder block (4; 404) while arranged in the predetermined position.

2. The cylinder block according to claim 1, characterized in that a positioning portion (28) for determining a mounting position of the outer cylinder block (6; 406) with respect to the main body cylinder block (4; 404) is formed on at least one of the main body cylinder block (4; 404) and the outer cylinder block (6; 406).

3. The cylinder block according to claim 1 or claim 2, characterized in that the outer cylinder block (6; 406) is formed of a resin or a resin composite.

4. The cylinder block according to claim 1 or claim 2, characterized in that the outer cylinder block (6; 406) is formed of one or two or more materials selected from the group consisting of an aluminum alloy, a magnesium alloy, a resin, a resin composite, and a ceramic.

5. The cylinder block according to any one of claims 1 to 4, characterized in that the main body cylinder block (4; 404) is molded by casting using an aluminum alloy or a magnesium alloy.

6. The cylinder block according to claim 5, characterized in that the main body

REPLACED BY ART 34 AMDT

cylinder block (4; 404) has a cylinder liner (22; 422) cast into a bore portion of the main body cylinder block (4; 404).

7. The cylinder block according to claim 5, characterized in that a bore portion of the main body cylinder block (4; 404) is surface treated so as to be wear-resistant.

8. A cylinder head in which a water jacket is formed around a cylinder top portion, and which, combined with a separate cylinder block (210), forms an engine main body, the cylinder head characterized by comprising:

a main body cylinder head (208) which has a mounting surface and which defines a cylinder top portion side of the water jacket, and

an outer cylinder head (206) which is molded separately from the main body cylinder head (208) as a cylinder head portion which defines a side of the water jacket opposite the cylinder side, the outer cylinder head being arranged in a predetermined position so as to be on the mounting surface (224) of the main body cylinder head (208) so as to define, together with the main body cylinder head (208), the water jacket, the outer cylinder head (206) to be fixed in place while pressed between the cylinder block (210) and the main body cylinder head (208) while arranged in the predetermined position.

9. The cylinder head according to claim 8, characterized in that a positioning portion for determining a mounting position of the outer cylinder head (206) with respect to the main body cylinder head (208) is formed on at least one of the main body cylinder head (208) and the outer cylinder head (206).

10. The cylinder head according to claim 8 or claim 9, characterized in that the outer cylinder head (206) is formed of a resin or a resin composite.

11. The cylinder head according to claim 8 or claim 9, characterized in that the outer cylinder head (206) is formed of one or two or more materials selected from the group consisting of an aluminum alloy, a magnesium alloy, a resin, a resin composite, and a ceramic.

12. The cylinder head according to any one of claims 8 to 11, characterized in that the main body cylinder head (208) is molded by casting using an aluminum alloy or a

REPLACED BY ART 34 AMDT

magnesium alloy.

13. An engine main body which includes a cylinder block (110) in which a water jacket (150a, 150b) is formed around a cylinder (112), and a cylinder head in which the water jacket (150a, 150b) is formed around a cylinder top portion, the engine main body characterized by comprising:

a main body cylinder block (104) which has a mounting surface and which defines a cylinder side of the water jacket (150a, 150b);

a main body cylinder head (108) which has a mounting surface and which forms a cylinder top portion side of the water jacket (150a, 150b); and

an outer cylinder block (106) which is molded separately from the main body cylinder block (104) and the main body cylinder head (108) as a cylinder block portion which defines a side of the water jacket (150a, 150b) opposite the cylinder (112) side and the cylinder top portion side, the outer cylinder block (106) being arranged in a predetermined position so as to be between the mounting surface of the main body cylinder block (104) and the mounting surface of the main body cylinder head (108) so as to define, together with the main body cylinder block (104) and the main body cylinder head (108), the water jacket (150a, 150b), the outer cylinder block (106) being fixed in place while pressed between the main body cylinder block (104) and the main body cylinder head (108) while arranged in the predetermined position.

14. The engine main body according to claim 13, characterized in that a positioning portion for determining a mounting position of the outer cylinder block (106) with respect to the main body cylinder block (104) is formed on at least one of the main body cylinder block (104) and the outer cylinder block (106).

15. The engine main body according to claim 13 or claim 14, characterized in that the outer cylinder block (106) is formed of a resin or a resin composite.

16. The engine main body according to claim 13 or claim 14, characterized in that the outer cylinder block (106) is formed of one or two or more materials selected from the group consisting of an aluminum alloy, a magnesium alloy, a resin, a resin composite, and a ceramic.

17. The engine main body according to any one of claims 13 to 16, characterized in that the main body cylinder block (104) is molded by casting using an aluminum alloy or a magnesium alloy.

18. The engine main body according to claim 17, characterized in that the main body cylinder block (104) has a cylinder liner cast into a bore portion of the main body cylinder block (104).

19. The engine main body according to claim 17, characterized in that a bore portion of the main body cylinder block (104) is surface treated so as to be wear-resistant.

20. The engine main body according to any one of claims 13 to 19, characterized in that the main body cylinder head (108) is molded by casting using an aluminum alloy or a magnesium alloy.

21. The engine main body according to any one of claims 13 to 20, characterized in that the outer cylinder block (106) is fixed between the main body cylinder block (104) and the main body cylinder head (108) with a fastening bolt (152).

22. An engine main body characterized by comprising the cylinder block according to any one of claims 1 to 7 and a cylinder head, the outer cylinder block (406) being fixed between the main body cylinder block (404) and the cylinder head with a fastening bolt.

23. The engine main body according to any one of claims 13 to 22, characterized in that sealing material (435) or welding is used to seal between the main body cylinder block (404) and the outer cylinder block (406).

REPLACED BY ART 34 AMDT

24. An engine main body characterized by comprising the cylinder head according to any one of claims 8 to 12 and a cylinder block, the outer cylinder head (206) being fixed between the cylinder block and the main body cylinder head (208) with a fastening bolt.

25. The engine main body according to claim 24, characterized in that sealing material or welding is used to seal between the main body cylinder head (208) and the outer cylinder head (206).

26. An engine main body which includes a cylinder block (210) in which a water jacket is formed around a cylinder, and a cylinder head in which the water jacket is formed around a cylinder top portion, the engine main body characterized by comprising:

the cylinder block (210) which has a mounting surface and which defines a cylinder side of the water jacket;

a main body cylinder head (208) which has a mounting surface (224) and which defines the cylinder top portion side of the water jacket; and

an outer cylinder head (206) which is molded separately from the main body cylinder head (208) as a cylinder head portion which defines a side of the water jacket opposite the cylinder side, the outer cylinder head (206) being arranged in a predetermined position so as to be on the mounting surface of the main body cylinder head (208) so as to define, together with the cylinder block (210) and the main body cylinder head (208), the water jacket, the outer cylinder head (206) being fixed in place while pressed between the cylinder block and the main body cylinder head (208) while arranged in the predetermined position.